may be obtained in the temperature region around room temperature thereby eliminating the need for cryogenic cooling procedures, said deficiency of charge being detected at a charge amplifier output stage of a CCD array or of a single active pixel stage, said amplifier stage consisting of a floating gate correlated CCD double sampler or a floating diffusion output node with a reset gate capability with the output in either case connected to a differential amplifier such that the electronic output signal from said amplifier represents the difference between a full well of charge and the amount of charge actually transferred from said imaged pixel, said difference signal being reduced in noise content compared to the noise existing on said actual pixel charge.

Add A2

Add B5

ABSTRACT

A photon detector is obtained by using the intersubband absorption mechanism in a modulation doped quantum well(s). The modulation doping creates a very high electric field in the well which enables absorption of input TE polarized light and also conducts the carriers emitted from the well into the modulation doped layer from where they may recombine with carriers from the gate contact. Carriers are resupplied to the well by the generation of electrons across the energy gap of the quantum well material. The absorption is enhanced by the use of a resonant cavity in which the quantum well(s) are placed. The absorption and emission from the well creates a deficiency of charge in the quantum well proportional to the intensity of the input photon signal. The quantity of charge in the quantum well of each detector is converted to an output voltage by transferring the charge to the gate of an output amplifier. The detectors are arranged in

the form of a 2D array with an output amplifier associated with the entire array or a row of the array as in the known charge coupled devices, or a separate amplifier could be dedicated to each pixel as in the known architecture of the active pixel device. This detector has the unique advantage of near room temperature operation because the dark current is limited to the generation across the semiconductor bandgap and not the emission over the quantum well barrier. The detector also has the advantage that the readout circuitry is implemented monolithically by the HFETs formed in the GaAs substrate simultaneously, with the detecting elements.